


# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>AJC/P100781WO</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/GB 03/04192</b>	International filing date ( <i>day/month/year</i> ) <b>29.09.2003</b>	Priority date ( <i>day/month/year</i> ) <b>27.09.2002</b>
International Patent Classification (IPC) or both national classification and IPC <b>C01B37/00</b>		
Applicant <b>BRITISH NUCLEAR FUELS PLC et al.</b>		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 4 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I <input checked="" type="checkbox"/> Basis of the opinion</li> <li>II <input type="checkbox"/> Priority</li> <li>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li>IV <input type="checkbox"/> Lack of unity of invention</li> <li>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI <input type="checkbox"/> Certain documents cited</li> <li>VII <input type="checkbox"/> Certain defects in the international application</li> <li>VIII <input checked="" type="checkbox"/> Certain observations on the international application</li> </ul>		
Date of submission of the demand  <b>24.03.2004</b>	Date of completion of this report  <b>18.01.2005</b>	
Name and mailing address of the international preliminary examining authority:   <b>European Patent Office</b> <b>D-80298 Munich</b> <b>Tel. +49 89 2399 - 0 Tx: 523656 epmu d</b> <b>Fax: +49 89 2399 - 4465</b>	Authorized Officer  <b>Rhodes, K</b>  Telephone No. <b>+49 89 2399-8259</b>	



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/GB 03/04192**

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-5 as originally filed

**Claims, Numbers**

1-30 filed with telefax on 30.08.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

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**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims	1-30
	No: Claims	
Inventive step (IS)	Yes: Claims	1-30
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-30
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

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**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Reference is made to the following documents:**

- D1: WO 89 09749 A (MOBIL OIL CORP) 19 October 1989 (1989-10-19)  
D2: EP-A-1 142 833 (DALIAN CHEMICAL PHYSICS INST) 10 October 2001  
(2001-10-10) cited in the application  
D3: NEERAJ ESWARAMOORTHY M ET AL: 'Mesoporous silicophosphates'  
MATERIALS RESEARCH BULLETIN, ELSEVIER SCIENCE PUBLISHING,  
NEW YORK, US, vol. 33, no. 10, 1 October 1998 (1998-10-01), pages 1549-  
1554, XP004141813 ISSN: 0025-5408

**2. Novelty**

Document D1, which is considered to represent the most relevant state of the art, discloses the synthesis of a large pore crystalline molecular sieve. X-ray diffraction is employed to identify its crystal framework topology as comprising 18-membered rings, having a pore size of around 12-13 Angstroms in diameter (page 4, lines 12-16). The molecular sieve has a specific composition comprising aluminium, phosphorus and optionally a further metal e.g. silicon (page 5, lines 17-31). It is stated that the composition must satisfy the relationship given on page 6, line 7, and that where  $z$  is less than 0 but greater than -1, the molecular sieve will behave as an anion exchange material.

As document D1 does not disclose said microporous material as having a silicophosphate structure or a specific framework density, **claims 1 and 2** are novel (Article 33(2) PCT).

The subject-matter of independent **claims 4, 7 and 8** of the present application concerns a microporous silicophosphate material which comprises a positively charged framework and/or is useful as an ion exchange material. Said claims are novel over the disclosure of D1, which does not relate to silicophosphates.

Document D2 discloses a method for the manufacture of microporous metal-

silicoaluminophosphate molecular sieve materials having a negatively charged framework. Said molecular sieves are synthesised by mixing together sources of silicon, phosphorus, aluminium, and the metal compound with water and a templating agent. The mixture is first aged and then transferred to an autoclave to effect crystallisation. The collected solid product is then washed, dried and calcined (paragraph 15). Orthophosphoric acid is mentioned as a possible source of phosphorous, as are orthosilicate esters as a source of silicon (paragraph 16).

Document D3 discloses the preparation of mesoporous silicophosphate by ageing an acidic aqueous mixture of surfactants, tetraethylorthosilicate and phosphoric or phosphonic acid. The final product is then filtered and dried (experimental section).

As neither D2 nor D3 are prejudicial to the novelty of the method of the present application, concerning the synthesis of a microporous material comprising a silicophosphate, **claims 9-30** are novel.

### **3. Inventive Step**

The problem to be solved by the present application may be seen as how to provide an inexpensive anion exchange material, which is easily synthesised and is neither toxic nor causes environmental problems.

The present application finds a solution to the posed problem by providing an inorganic microporous material having a positively charged framework which is charge balanced by an anionic species. Said anionic species may be exchanged in an anion exchange process.

There is no suggestion in the prior art that microporous silicophosphates, having a positively charged framework, can be synthesised by the present method nor that such silicophosphates can be useful as or comprised in anion exchange materials. The applicant has plausibly described the silicophosphate, its method of manufacture and its uses although there are no supporting examples.

**Claims 1-30** are therefore accorded with an inventive step in the sense of Article 33(3) PCT.

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**4. Industrial Applicability**

The method of manufacture and microporous materials of the present application are of clear industrial applicability in the field of anion exchange, especially in the nuclear power industry.